

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-237353

(43)Date of publication of application : 08.09.1998

(51)Int.Cl.

C09D 1/00
B05D 5/00
C01B 15/047
C01B 33/14
C01G 23/04
G02B 1/10

(21)Application number : 09-038899

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(22)Date of filing : 24.02.1997

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(54) HYDROPHILIC COATING AGENT AND SURFACE HYDROPHILIC SUBSTRATE

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a hydrophilic coating agent excellent in hydrophilic property, film-forming property and antistatic property and capable of sufficiently exhibiting hydrophilic function without deteriorating a resin material and carrying out ultraviolet irradiation by including specific titanium oxide and silicon oxide.

SOLUTION: This hydrophilic coating agent comprises (A) an amorphous type titanium oxide such as amorphous type titanium peroxide sol (A1) [e.g. transparent yellow liquid obtained by adding a basic compound to an aqueous solution of titanium salt, washing and separating the resultant pale-bluish white and amorphous titanium hydroxide $\text{Ti}(\text{OH})_4$, namely orthotitanic acid H_4TiO_4 and treating the separated compound with hydrogen peroxide solution and having 6.0-7.0pH, 8-20nm particle diameter and normally 1.4-1.6wt.% sol concentration], (B) silica oxide such as colloidal silica and as necessary, further (C) an anatase type titanium oxide sol (e.g. obtained by heat-treating the component A1 at $\geq 100^\circ \text{C}$).

LEGAL STATUS

[Date of request for examination]

13.01.2004

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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CLAIMS

[Claim(s)]

[Claim 1] The hydrophilic coating agent containing an amorphous mold titanic-acid ghost and silicon oxide.

[Claim 2] The hydrophilic coating agent containing an amorphous mold titanic-acid ghost, silicon oxide, and a photocatalyst.

[Claim 3] The hydrophilic coating agent according to claim 1 or 2 whose amorphous mold titanic-acid ghost is an amorphous mold titanium peroxide sol.

[Claim 4] Claims 1-3 whose silicon oxide is colloidal silica are the hydrophilic coating agents of a publication either.

[Claim 5] The surface hydrophilic radical object characterized by making a base front face come to carry out coating of the hydrophilic coating agent according to claim 1 to 4.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] When base front faces, such as a lens, a mirror, a metal, a tile, glass, and fiber, a nonwoven fabric, are coated with this invention, it relates to the surface hydrophilic radical object which that front face coated with the hydrophilic coating agent and this hydrophilic coating agent which have a hydrophilic operation.

[0002]

[Description of the Prior Art] Conventionally, as a coating agent which gives a hydrophilic property, fog resistance, etc. to front faces, such as a spectacle lens, a bathroom mirror, and a hypodermic needle, silicon system resin is known well. Moreover, anatase mold titanium oxide TiO₂ which has photocatalyst ability The coating agent which consists of mixture with silicon system resin is coated, and the surface hydrophilic radical object which demonstrates a hydrophilic operation at the time of UV irradiation is also known.

[0003]

[Problem(s) to be Solved by the Invention] When silicon system resin was used as a hydrophilic coating agent, there was a trouble of the dust in atmospheric air etc. having ****(ed) and soiling the front face black with static electricity produced in a silicon system resin side. Moreover, the anatase mold titanium oxide TiO₂ which has the above-mentioned photocatalyst ability to the organic giant-molecule resin substrate (a plastic sheet and plastic lens) currently used abundantly as a base which makes current and a photocatalyst support Although ****, such as dust in atmospheric air, could be prevented according to the electrostatic-discharge prevention operation by titanium oxide when the hydrophilic coating agent which consists of silicon system resin was applied, there was a trouble that degradation of plastics material which consists of organic giant-molecule resin by the photocatalyst function was remarkable. Moreover, anatase mold titanium oxide TiO₂ which has this photocatalyst ability Having needed UV irradiation, in order to demonstrate a hydrophilic function, and the hydrophilic coating agent which consists of silicon system resin having un-arranged [that a hydrophilic function cannot be demonstrated], when installed in the location where ultraviolet rays are not irradiated.

[0004]

[Means for Solving the Problem] In order to solve the above-mentioned problem, when it inquires wholeheartedly, the coating agent which consists of mixture of an amorphous mold titanic-acid ghost and silicon oxide Excel in membrane formation nature, and it not only has the extremely excellent hydrophilic property, but in addition, have the static electricity ***** operation, and it does not carry out electrostatic adhesion of the dirt. And it finds out that a hydrophilic function can be enough demonstrated even place [which does not have about / not degrading organic macromolecule resin material / and UV irradiation], and came to complete this invention.

[0005] Moreover, even if it was the case where there was no UV irradiation in the mixture of an amorphous mold titanic-acid ghost and silicon oxide when bases, such as glass and a tile, are coated with the coating agent which comes to mix with a photocatalyst further, it came to complete a header and this invention for a surface hydrophilic-property function being demonstrated.

[0006] That is, this invention relates to the surface hydrophilic radical object characterized by making the hydrophilic coat (layer) containing amorphous mold titanic-acid ghosts, such as an amorphous mold titanium peroxide sol, and silicon oxides, such as colloidal silica, form in a base front face. Moreover, this invention relates to the surface hydrophilic radical object characterized by making the hydrophilic coat (layer) containing amorphous mold titanic-acid ghosts, such as an amorphous mold titanium peroxide sol, silicon oxide, such as colloidal silica, and photocatalysts, such as anatase mold titanium oxide, form in a base front face. Furthermore, this invention relates to the hydrophilic coating agent containing amorphous mold titanic-acid ghosts, such as a hydrophilic coating agent containing amorphous mold titanic-acid ghosts, such as an amorphous mold titanium peroxide sol, and silicon oxide, such as colloidal silica, and an amorphous mold titanium peroxide sol, silicon oxide, such as colloidal silica, and photocatalysts, such as anatase mold titanium oxide.

[0007]

[Embodiment of the Invention] It sets to this invention and is titanium peroxide TiO₃ of an amorphous mold as an amorphous mold titanic-acid ghost. Amorphous mold titanium oxide TiO₂ It can illustrate. In titanium peroxide and amorphous mold titanium oxide of an amorphous mold, it is anatase mold titanium oxide TiO₂. Rutile type titanium dioxide TiO₂ It differs and there is almost no photocatalyst function on parenchyma.

[0008] As amorphous mold titanium peroxide used in this invention, especially a desirable amorphous mold titanium peroxide sol can be manufactured as follows, for example. Titanium tetrachloride TiCl₄ Aqueous ammonia thru/or hydroxylation alkali like a sodium hydroxide are added to a titanium salt water solution [like]. If the hydroxylation titanium (OH) Ti 4 of light blueness white and amorphism to produce is also called alt.titanic-acid H₄TiO₄ and processes this hydroxylation titanium with hydrogen peroxide solution after washing / separation, the titanium peroxide liquid of the amorphous gestalt of this invention will be obtained. This amorphous mold titanium peroxide sol is 8-20nm in pH 6.0-7.0 and particle diameter, and that appearance is the liquid of yellow transparence, and even if it saves it in ordinary temperature for a long period of time, it is stable. Moreover, although sol concentration is usually adjusted to 1.40 - 1.60%, when the concentration can be adjusted if needed and it uses it by low concentration, it is diluted and used with distilled water etc.

[0009] Moreover, in ordinary temperature, it does not yet crystallize to anatase mold titanium oxide in the amorphous condition, but this amorphous mold titanium peroxide sol is excellent in adhesion, membrane formation nature can be high, and a thin film [that it

is uniform and flat] can be created, and the desiccation coat has the property of being stable, to the photocatalyst besides the property in which it does not melt into water. In addition, if the sol of the titanium peroxide of an amorphous mold is heated above 100 degrees C, what carried out after [coating] desiccation immobilization of the amorphous mold titanium peroxide sol at the base will become anatase mold titanium oxide with heating of 250 degrees C or more by beginning to change to an anatase mold titanium oxide sol.

[0010] The sol-like thing which made solvents, such as a nitric acid, carry out suspension distribution of an impalpable powder-like thing or the thing of the shape of this impalpable powder as amorphous mold titanium oxide used in this invention is known. When using an impalpable powder-like thing among the amorphous mold titanium oxide which does not have this photocatalyst function, it will mix with binders, such as heat-curing water soluble resin, and will coat.

[0011] As a silicon oxide used in this invention, although siloxanes compounds, such as silicone besides silicon dioxides, such as colloidal silica, and organopolysiloxane, and water glass can be mentioned, colloidal silica is desirable.

[0012] As a photocatalyst which can be used in this invention, TiO_2 , ZnO , SrTiO_3 , CdS , Although CdO , CaP , InP , In_2O_3 , CaAs , BaTiO_3 , K_2NbO_3 , Fe_2O_3 , Ta_2O_5 , WO_3 and SnO_2 , Bi_2O_3 , NiO , Cu_2O , SiC , SiO_2 , MoS_2 and MoS_3 , InPb , RuO_2 , CeO_2 , etc. can be mentioned Powdered also in these, or sol-like anatase mold titanium oxide TiO_2 It is desirable.

[0013] Although sol-like anatase mold titanium oxide, i.e., an anatase mold titanium oxide sol, can be manufactured as mentioned above by heating an amorphous mold titanium peroxide sol at the temperature of 100 degrees C or more, the titanium oxide sol of the anatase mold which the description of an anatase mold titanium oxide sol changes with heating temperature and heating time somewhat, for example, is generated by processing at 100 degrees C for 6 hours is 8–20nm in pH 7.5–9.5 and particle diameter, and the appearance is the liquid of yellow suspension. Even if it saves this anatase mold titanium oxide sol in ordinary temperature for a long period of time, it is stable, but when it mixes with an acid metallurgy group water solution etc., precipitate may arise, and if Na ion exists, photocatalyst activity and acid resistance may be spoiled. Moreover, although sol concentration is usually adjusted to 2.70 – 2.90% of the weight, it can also adjust and use the concentration if needed.

[0014] As a photocatalyst, "ST-01" (Ishihara Sangyo Kaisha, Ltd. make) of marketing and "ST-31" (Ishihara Sangyo Kaisha, Ltd. make) can be used as a titanium dioxide of the shape of powder besides the above-mentioned anatase mold titanium oxide sol. In this case, although anythings can be used if a photocatalyst operation does not receive degradation and a photocatalyst function is not reduced as a binder, it is desirable to use the above-mentioned amorphous mold titanium peroxide sol which has the outstanding adhesive property in ordinary temperature.

[0015] On a photocatalyst object, photocatalyst functional auxiliary addition metals (Pt, Ag, Rh, RuO , Nb, Cu, Sn, NiO, etc.) can also be added in the manufacture process as what carries out the promotion complement of the photocatalysis. Moreover, the particle which mixed the particles of a spontaneous mold ultraviolet radiation agent or a light storage mold ultraviolet radiation agent or these radiation agents with the photocatalyst in front of shaping is also mixable.

[0016] The hydrophilic coating agent of this invention can be made to contain the dielectric ceramic ingredient and the conductive ceramic ingredient which have an ultraviolet-rays cutoff function and an electrostatic-discharge prevention function with amorphous mold titanium oxide and a silicon oxide if needed.

[0017] Although the thing of the metal quality of the materials, such as aluminum and steel, can be used for the organic quality of the materials, such as quality of non-equipments, such as ceramics and glass, organic macromolecule resin, rubber, a tree, and paper, and a list, when using that by which the photocatalyst was contained in the coating agent as a base with which the hydrophilic constituent of this invention is supported, the base which consists of organic macromolecule material is not desirable. Moreover, what it was not restricted to the magnitude or form, but the shape of the shape of the shape of the shape of tabular, a needle, and a honeycomb and a fiber and a filtration sheet and a bead, the letter of firing, and they accumulated may be used.

[0018] As the coating approach of the coating agent of this invention, the approach of making a thin film by methods of construction, such as a spray coat, dipping, and a spin coat, is mentioned. Moreover, although determined by film formation engine performance which the purpose of hydrophilic grant can attain as thickness of a coating thin film (layer), such as thickness and a binder, when using the coating agent which consists of mixture of the amorphous mold titanium peroxide sol which also has the binder function, for example, and colloidal silica, coating is usually carried out to the thickness of 0.5 micrometers – 5.0 micrometers.

[0019] The hydrophilic coating agent of this invention can be used for dirt prevention of building materials, such as silicon system sealing materials, oily caulking materials, etc. between the stimulus pain mitigation at the time of cloudy prevention of show cased glass, a bathroom mirror, a spectacle lens, the window glass of an automobile, and the body and impregnation of a hypodermic needle in the living body, a windowpane, dew condensation prevention of a skylight, a bathroom, and modular baths, between an outer wall and window frames, between a tile and a tile, etc., etc. Moreover, in the case of the coating agent containing a photocatalyst, since the contamination organic substance, such as dust adhering to the base front face which consists of non-equipments, such as glass and a tile, an oil, and dirt, is disassembled by photocatalyst operation, it can use for sheathing construction material etc.

[0020]

[Example] Although an example is hung up over below and this invention is explained to it still more concretely, the technical range of this invention is not limited to these instantiation.

The example 1 (manufacture of an amorphous mold titanium peroxide sol) of reference

It counteracts by mixing what diluted 50% solution (Sumitomo SHITIKUSU, Inc.) of a titanium tetrachloride TiCl_4 with distilled water 70 times, and the thing which diluted 25% solution (Takasugi Pharmaceuticals incorporated company) of ammonium hydroxide NH_4OH with distilled water 10 times to a capacity factor 7:1. The neutralization back pH is adjusted to 6.5–6.8, and the supernatant liquor after neglect is thrown away for a while. About 4 times as much distilled water as the amount of gels of $\text{Ti}(\text{OH})_4$ which remained is added, and it fully agitates and is left. Rinsing is repeated until it checks with a silver chloride and the chlorine ion in supernatant liquor is no longer detected, finally supernatant liquor is thrown away, and it leaves only gel. Depending on the case, centrifugal separation can perform dehydration processing. If it adds in every 30-minute 2 steps and 210ml of 35% hydrogen peroxide solution is agitated at about 5 degrees C to $\text{Ti}(\text{OH})_4$ 3600ml of this light blueness white overnight, amorphous mold titanium peroxide sol about 2500ml of yellow transparence will be obtained. In addition, in the above-mentioned process, since the insoluble matter may deposit in water, such as metatitanic acid, if generation of heat is not suppressed, as for all processes, it is desirable to suppress generation of heat and to perform it.

[0021] The example 2 (manufacture of the titanium oxide sol from an amorphous mold titanium peroxide sol) of reference

If the above-mentioned amorphous mold titanium peroxide sol is heated at 100 degrees C, anatase mold titanium oxide will arise

after progress for about 3 hours, and if it heats for about 6 hours, an anatase mold titanium oxide sol will be obtained. Moreover, although the thing of yellow opacity will be obtained if it heats at 100 degrees C for 8 hours and light yellow and ***** fluorescence will be tintured with and condensed, and the thing of **** yellow will be obtained if it heats at 100 degrees C for 16 hours, compared with the above-mentioned 100 degrees C and the thing of 6-hour heating, as for these, a desiccation degree of adhesion falls somewhat. Since viscosity is falling compared with amorphous mold titanium peroxide, this titanium oxide sol is used to 2.5 % of the weight, condensing so that it may be easy to carry out dipping.

[0022] What carried out two fold serial dilution of the amorphous mold titanium peroxide sol (it contains 1.7% of the weight as TiO₃) produced by the example of reference to the float glass of 1150x150mm of examples. It is colloidal silica (the Nissan chemistry company make, trade name Snow tex, and SiO₂ are contained 20.7%) TiO₃ Receiving SiO₂ The weight ratio coated the above-mentioned base using what was mixed so that it might become 0%, 0.5%, 1%, 2%, and 8%, respectively. spray gun FS-G05R-1 which has a round shape blowdown nozzle with a diameter [by Meiji Machine Co., Ltd.] of 0.54mm in coating — 2 kg/cm³ the Ayr ** — using — the amount of blasting — 0.2g/100cm² ** — it carried out and was made to dry at 80 degrees C after spraying Moreover, what did not carry out surface coating was used as contrast.

[0023] Next, 0.1ml of tap water was dropped at each glass substrate from height of 1cm by the syringe, and the experiment which measures the diameter (phi: unit mm) of the waterdrop on a substrate was repeated 4 times after neglect for about 10 minutes, without irradiating ultraviolet rays. A result is shown in Table 1. As shown also in Table 1, the surface hydrophilic radical object concerning this invention showed the outstanding hydrophilic property.

[0024]

[Table 1]

アモルファス型酸化チタンゾル	S i O ₂ 混合率 (重量%)					
	0	0.5	1	2	8	対照
1 回	10φ	13φ	15φ	16φ	18φ	11φ
2 回	9φ	11φ	13φ	14φ	17φ	10φ
3 回	9φ	10.5φ	12.5φ	14φ	17φ	10φ
4 回	10φ	11φ	12.5φ	14.5φ	18φ	10φ

[0025] Example 2 amorphous mold titanium peroxide sol TiO₃ It replaced with, and when the coating agent which consists of mixture of amorphous mold titanium oxide powder (the Idemitsu Kosan make, a trade name; Idemitsu titania) and the heat-curing water soluble resin as a binder was used and also having been carried out like the example 1, the almost same result was obtained.

[0026] When replaced with example 3 colloidal silica, and aquosity acrylic silicon resin (the Rock Paint Co., Ltd. make, a trade name; SHIRIKOMAKKUSU) was used and also having been carried out like the example 1, the almost same result was obtained.

[0027] It is the anatase mold titanium oxide sol further obtained in the example 2 of reference as a photocatalyst by the coating agent of example 4 example 1 TiO₃ Receiving TiO₂ What was added so that a weight ratio might be set to about 1:3 was used, and also it carried out like the example 1. A result is shown in Table 2. As shown also in Table 2, the surface hydrophilic radical object concerning this invention showed the hydrophilic property which was excellent in spite of having not been UV irradiation Shimo. Moreover, as for the coating layer, it turned out under UV irradiation that after prolonged progress does not change at all.

[0018]

[Table 2]

アモルファス型酸化チタンゾル + アナターゼ型酸化チタンゾル	S i O ₂ 混合率 (重量%)					
	0	0.5	1	2	8	対照
1 回	11φ	15φ	17φ	18φ	18.5φ	10φ
2 回	12φ	13.5φ	15.5φ	18φ	20φ	11φ
3 回	11φ	15φ	16.5φ	18φ	21φ	10φ
4 回	10φ	12φ	14φ	18φ	19.5φ	10φ

[0021]

[Effect of the Invention] Even place [the hydrophilic coating agent constituent of this invention absorbs about / excelling in membrane formation nature, having an electrostatic prevention operation in addition, and not carrying out electrostatic adhesion of the dirt it not only being able to giving the extremely excellent hydrophilic property, but, and not degrading an organic macromolecule resin substrate / and ultraviolet rays, and does not have UV irradiation], it can demonstrate a hydrophilic function enough.

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TECHNICAL FIELD

[Field of the Invention] When base front faces, such as a lens, a mirror, a metal, a tile, glass, and fiber, a nonwoven fabric, are coated with this invention, it relates to the surface hydrophilic radical object which that front face coated with the hydrophilic coating agent and this hydrophilic coating agent which have a hydrophilic operation.

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PRIOR ART

[Description of the Prior Art] Conventionally, as a coating agent which gives a hydrophilic property, fog resistance, etc. to front faces, such as a spectacle lens, a bathroom mirror, and a hypodermic needle, silicon system resin is known well. Moreover, anatase mold titanium oxide TiO_2 which has photocatalyst ability The coating agent which consists of mixture with silicon system resin is coated, and the surface hydrophilic radical object which demonstrates a hydrophilic operation at the time of UV irradiation is also known.

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EFFECT OF THE INVENTION

[Effect of the Invention] Even place [the hydrophilic coating agent constituent of this invention absorbs about / excelling in membrane formation nature, having an electrostatic prevention operation in addition, and not carrying out electrostatic adhesion of the dirt it not only being able to giving the extremely excellent hydrophilic property, but, and not degrading an organic macromolecule resin substrate / and ultraviolet rays, and does not have UV irradiation], it can demonstrate a hydrophilic function enough.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] When silicon system resin was used as a hydrophilic coating agent, there was a trouble of the dust in atmospheric air etc. having ****(ed) and soiling the front face black with static electricity produced in a silicon system resin side. Moreover, the anatase mold titanium oxide TiO_2 which has the above-mentioned photocatalyst ability to the organic giant-molecule resin substrate (a plastic sheet and plastic lens) currently used abundantly as a base which makes current and a photocatalyst support Although ****, such as dust in atmospheric air, could be prevented according to the electrostatic-discharge prevention operation by titanium oxide when the hydrophilic coating agent which consists of silicon system resin was applied, there was a trouble that degradation of plastics material which consists of organic giant-molecule resin by the photocatalyst function was remarkable. Moreover, anatase mold titanium oxide TiO_2 which has this photocatalyst ability Having needed UV irradiation, in order to demonstrate a hydrophilic function, and the hydrophilic coating agent which consists of silicon system resin having un-arranged [that a hydrophilic function cannot be demonstrated], when installed in the location where ultraviolet rays are not irradiated.

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MEANS

[Means for Solving the Problem] In order to solve the above-mentioned problem, when it inquires wholeheartedly, the coating agent which consists of mixture of an amorphous mold titanic-acid ghost and silicon oxide Excel in membrane formation nature, and it not only has the extremely excellent hydrophilic property, but in addition, have the static electricity ***** operation, and it does not carry out electrostatic adhesion of the dirt. And it finds out that a hydrophilic function can be enough demonstrated even place [which does not have about / not degrading organic macromolecule resin material / and UV irradiation], and came to complete this invention.

[0005] Moreover, even if it was the case where there was no UV irradiation in the mixture of an amorphous mold titanic-acid ghost and silicon oxide when bases, such as glass and a tile, are coated with the coating agent which comes to mix with a photocatalyst further, it came to complete a header and this invention for a surface hydrophilic-property function being demonstrated.

[0006] That is, this invention relates to the surface hydrophilic radical object characterized by making the hydrophilic coat (layer) containing amorphous mold titanic-acid ghosts, such as an amorphous mold titanium peroxide sol, and silicon oxides, such as colloidal silica, form in a base front face. Moreover, this invention relates to the surface hydrophilic radical object characterized by making the hydrophilic coat (layer) containing amorphous mold titanic-acid ghosts, such as an amorphous mold titanium peroxide sol, silicon oxide, such as colloidal silica, and photocatalysts, such as anatase mold titanium oxide, form in a base front face. Furthermore, this invention relates to the hydrophilic coating agent containing amorphous mold titanic-acid ghosts, such as a hydrophilic coating agent containing amorphous mold titanic-acid ghosts, such as an amorphous mold titanium peroxide sol, and silicon oxide, such as colloidal silica, and an amorphous mold titanium peroxide sol, silicon oxide, such as colloidal silica, and photocatalysts, such as anatase mold titanium oxide.

[0007]

[Embodiment of the Invention] It sets to this invention and is titanium peroxide TiO_3 of an amorphous mold as an amorphous mold titanic-acid ghost. Amorphous mold titanium oxide TiO_2 It can illustrate. In titanium peroxide and amorphous mold titanium oxide of an amorphous mold, it is anatase mold titanium oxide TiO_2 . Rutile type titanium dioxide TiO_2 It differs and there is almost no photocatalyst function on parenchyma.

[0008] As amorphous mold titanium peroxide used in this invention, especially a desirable amorphous mold titanium peroxide sol can be manufactured as follows, for example. Titanium tetrachloride TiCl_4 Aqueous ammonia thru/or hydroxylation alkali like a sodium hydroxide are added to a titanium salt water solution [like]. If the hydroxylation titanium (OH) Ti 4 of light blueness white and amorphism to produce is also called alt. titanic-acid H_4TiO_4 and processes this hydroxylation titanium with hydrogen peroxide solution after washing / separation, the titanium peroxide liquid of the amorphous gestalt of this invention will be obtained. This amorphous mold titanium peroxide sol is 8-20nm in pH 6.0-7.0 and particle diameter, and that appearance is the liquid of yellow transparence, and even if it saves it in ordinary temperature for a long period of time, it is stable. Moreover, although sol concentration is usually adjusted to 1.40 - 1.60%, when the concentration can be adjusted if needed and it uses it by low concentration, it is diluted and used with distilled water etc.

[0009] Moreover, in ordinary temperature, it does not yet crystallize to anatase mold titanium oxide in the amorphous condition, but this amorphous mold titanium peroxide sol is excellent in adhesion, membrane formation nature can be high, and a thin film [that it is uniform and flat] can be created, and the desiccation coat has the property of being stable, to the photocatalyst besides the property in which it does not melt into water. In addition, if the sol of the titanium peroxide of an amorphous mold is heated above 100 degrees C, what carried out after [coating] desiccation immobilization of the amorphous mold titanium peroxide sol at the base will become anatase mold titanium oxide with heating of 250 degrees C or more by beginning to change to an anatase mold titanium oxide sol.

[0010] The sol-like thing which made solvents, such as a nitric acid, carry out suspension distribution of an impalpable powder-like thing or the thing of the shape of this impalpable powder as amorphous mold titanium oxide used in this invention is known. When using an impalpable powder-like thing among the amorphous mold titanium oxide which does not have this photocatalyst function, it will mix with binders, such as heat-curing water soluble resin, and will coat.

[0011] As a silicon oxide used in this invention, although siloxanes compounds, such as silicone besides silicon dioxides, such as colloidal silica, and organopolysiloxane, and water glass can be mentioned, colloidal silica is desirable.

[0012] As a photocatalyst which can be used in this invention, TiO_2 , ZnO , SrTiO_3 , CdS , Although CdO , CaP , InP , In_2O_3 , CaAs , BaTiO_3 , K_2NbO_3 , Fe_2O_3 , Ta_2O_5 , WO_3 and SnO_2 , Bi_2O_3 , NiO , Cu_2O , SiC , SiO_2 , MoS_2 and MoS_3 , InPb , RuO_2 , CeO_2 , etc. can be mentioned Powdered also in these, or sol-like anatase mold titanium oxide TiO_2 It is desirable.

[0013] Although sol-like anatase mold titanium oxide, i.e., an anatase mold titanium oxide sol, can be manufactured as mentioned above by heating an amorphous mold titanium peroxide sol at the temperature of 100 degrees C or more, the titanium oxide sol of the anatase mold which the description of an anatase mold titanium oxide sol changes with heating temperature and heating time somewhat, for example, is generated by processing at 100 degrees C for 6 hours is 8-20nm in pH 7.5-9.5 and particle diameter, and the appearance is the liquid of yellow suspension. Even if it saves this anatase mold titanium oxide sol in ordinary temperature for a long period of time, it is stable, but when it mixes with an acid metallurgy group water solution etc., precipitate may arise, and if Na ion exists, photocatalyst activity and acid resistance may be spoiled. Moreover, although sol concentration is usually adjusted to 2.70 - 2.90% of the weight, it can also adjust and use the concentration if needed.

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this case, although anything can be used if a photocatalyst operation does not receive degradation and a photocatalyst function is not reduced as a binder, it is desirable to use the above-mentioned amorphous mold titanium peroxide sol which has the outstanding adhesive property in ordinary temperature.

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[0016] The hydrophilic coating agent of this invention can be made to contain the dielectric ceramic ingredient and the conductive ceramic ingredient which have an ultraviolet-rays cutoff function and an electrostatic-discharge prevention function with amorphous mold titanium oxide and a silicon oxide if needed.

[0017] Although the thing of the metal quality of the materials, such as aluminum and steel, can be used for the organic quality of the materials, such as quality of non-equipments, such as ceramics and glass, organic macromolecule resin, rubber, a tree, and paper, and a list, when using that by which the photocatalyst was contained in the coating agent as a base with which the hydrophilic constituent of this invention is supported, the base which consists of organic macromolecule material is not desirable. Moreover, what it was not restricted to the magnitude or form, but the shape of the shape of the shape of the shape of tabular, a needle, and a honeycomb and a fiber and a filtration sheet and a bead, the letter of firing, and they accumulated may be used.

[0018] As the coating approach of the coating agent of this invention, the approach of making a thin film by methods of construction, such as a spray coat, dipping, and a spin coat, is mentioned. Moreover, although determined by film formation engine performance which the purpose of hydrophilic grant can attain as thickness of a coating thin film (layer), such as thickness and a binder, when using the coating agent which consists of mixture of the amorphous mold titanium peroxide sol which also has the binder function, for example, and colloidal silica, coating is usually carried out to the thickness of 0.5 micrometers - 5.0 micrometers.

[0019] The hydrophilic coating agent of this invention can be used for dirt prevention of building materials, such as silicon system sealing materials, oily caulking materials, etc. between the stimulus pain mitigation at the time of cloudy prevention of show cased glass, a bathroom mirror, a spectacle lens, the window glass of an automobile, and the body and impregnation of a hypodermic needle in the living body, a windowpane, dew condensation prevention of a skylight, a bathroom, and modular baths, between an outer wall and window frames, between a tile and a tile, etc., etc. Moreover, in the case of the coating agent containing a photocatalyst, since the contamination organic substance, such as dust adhering to the base front face which consists of non-equipments, such as glass and a tile, an oil, and dirt, is disassembled by photocatalyst operation, it can use for sheathing construction material etc.

[Translation done.]

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
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3. In the drawings, any words are not translated.

EXAMPLE

[Example] Although an example is hung up over below and this invention is explained to it still more concretely, the technical range of this invention is not limited to these instantiation.

The example 1 (manufacture of an amorphous mold titanium peroxide sol) of reference

It counteracts by mixing what diluted 50% solution (Sumitomo SHITIKUSU, Inc.) of a titanium tetrachloride $TiCl_4$ with distilled water 70 times, and the thing which diluted 25% solution (Takasugi Pharmaceuticals incorporated company) of ammonium hydroxide NH_4OH with distilled water 10 times to a capacity factor 7:1. The neutralization back pH is adjusted to 6.5-6.8, and the supernatant liquor after neglect is thrown away for a while. About 4 times as much distilled water as the amount of gels of $Ti(OH)_4$ which remained is added, and it fully agitates and is left. Rinsing is repeated until it checks with a silver chloride and the chlorine ion in supernatant liquor is no longer detected, finally supernatant liquor is thrown away, and it leaves only gel. Depending on the case, centrifugal separation can perform dehydration processing. If it adds in every 30-minute 2 steps and 210ml of 35% hydrogen peroxide solution is agitated at about 5 degrees C to $Ti(OH)_4$ 3600ml of this light blueness white overnight, amorphous mold titanium peroxide sol about 2500ml of yellow transparency will be obtained. In addition, in the above-mentioned process, since the insoluble matter may deposit in water, such as metatitanic acid, if generation of heat is not suppressed, as for all processes, it is desirable to suppress generation of heat and to perform it.

[0021] The example 2 (manufacture of the titanium oxide sol from an amorphous mold titanium peroxide sol) of reference

If the above-mentioned amorphous mold titanium peroxide sol is heated at 100 degrees C, anatase mold titanium oxide will arise after progress for about 3 hours, and if it heats for about 6 hours, an anatase mold titanium oxide sol will be obtained. Moreover, although the thing of yellow opacity will be obtained if it heats at 100 degrees C for 8 hours and light yellow and ***** fluorescence will be tintured with and condensed, and the thing of ***** yellow will be obtained if it heats at 100 degrees C for 16 hours, compared with the above-mentioned 100 degrees C and the thing of 6-hour heating, as for these, a desiccation degree of adhesion falls somewhat. Since viscosity is falling compared with amorphous mold titanium peroxide, this titanium oxide sol is used to 2.5 % of the weight, condensing so that it may be easy to carry out dipping.

[0022] What carried out two fold serial dilution of the amorphous mold titanium peroxide sol (it contains 1.7% of the weight as TiO_3) produced by the example of reference to the float glass of 1150x150mm of examples. It is colloidal silica (the Nissan chemistry company make, trade name Snow tex, and SiO_2 are contained 20.7%) TiO_3 Receiving SiO_2 The weight ratio coated the above-mentioned base using what was mixed so that it might become 0%, 0.5%, 1%, 2%, and 8%, respectively. spray gun FS-G05R-1 which has a round shape blowdown nozzle with a diameter [by Meiji Machine Co., Ltd.] of 0.54mm in coating -- 2 kg/cm³ the Ayr ** -- using -- the amount of blasting -- 0.2g/100cm² ** -- it carried out and was made to dry at 80 degrees C after spraying Moreover, what did not carry out surface coating was used as contrast.

[0023] Next, 0.1ml of tap water was dropped at each glass substrate from height of 1cm by the syringe, and the experiment which measures the diameter (phi: unit mm) of the waterdrop on a substrate was repeated 4 times after neglect for about 10 minutes, without irradiating ultraviolet rays. A result is shown in Table 1. As shown also in Table 1, the surface hydrophilic radical object concerning this invention showed the outstanding hydrophilic property.

[0024]

[Table 1]

アモルファス型チタンペル オキシド溶	S i O ₂ 混合率 (重量%)					
	0	0.5	1	2	8	対照
1回	10φ	13φ	15φ	16φ	18φ	11φ
2回	9φ	11φ	13φ	14φ	17φ	10φ
3回	9φ	10.5φ	12.5φ	14φ	17φ	10φ
4回	10φ	11φ	12.5φ	14.5φ	18φ	10φ

[0025] Example 2 amorphous mold titanium peroxide sol TiO_3 It replaced with, and when the coating agent which consists of mixture of amorphous mold titanium oxide powder (the Idemitsu Kosan make, a trade name; Idemitsu titania) and the heat-curing water soluble resin as a binder was used and also having been carried out like the example 1, the almost same result was obtained.

[0026] When replaced with example 3 colloidal silica, and aqueous acrylic silicon resin (the Rock Paint Co., Ltd. make, a trade name; SHIRIKOMAKKUSU) was used and also having been carried out like the example 1, the almost same result was obtained.

[0027] It is the anatase mold titanium oxide sol further obtained in the example 2 of reference as a photocatalyst by the coating agent of example 4 example 1 TiO_3 Receiving TiO_2 What was added so that a weight ratio might be set to about 1:3 was used, and also it carried out like the example 1. A result is shown in Table 2. As shown also in Table 2, the surface hydrophilic radical object concerning this invention showed the hydrophilic property which was excellent in spite of having not been UV irradiation Shimo. Moreover, as for the coating layer, it turned out under UV irradiation that after prolonged progress does not change at all.

[0018]

[Table 2]

アモルファス型酸化チタンゾル + ナターゼ型酸化チタンゾル	S i O ₂ 混合率 (重量%)					
	0	0.5	1	2	8	対照
1 回	11φ	15φ	17φ	18φ	18.5φ	10φ
2 回	12φ	13.5φ	15.5φ	18φ	20φ	11φ
3 回	11φ	15φ	16.5φ	18φ	21φ	10φ
4 回	10φ	12φ	14φ	18φ	19.5φ	10φ

[Translation done.]

(19) 日本国特許庁 (JP)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開平 10-237353

(43) 公開日 平成 10 年 (1998) 9 月 8 日

(51) Int. Cl.	識別記号	庁内整理番号	F I	技術表示箇所
C09D 1/00			C09D 1/00	
B05D 5/00			B05D 5/00	Z
C01B 15/047			C01B 15/047	
33/14			33/14	
C01G 23/04			C01G 23/04	Z

審査請求 未請求 請求項の数 5 O L (全 5 頁) 最終頁に続く

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(54) 【発明の名称】 親水性コーティング剤及び表面親水性基体

(57) 【要約】

【課題】 レンズ、鏡、金属、タイル、ガラス、繊維・不織布等の基体表面にコーティングすると、その表面が親水性作用を有する、親水性コーティング剤及び該親水性コーティング剤でコーティングした表面親水性基体を提供すること。

【解決手段】 アモルファス型過酸化チタンゾル等のアモルファス型チタン酸化物及びコロイダルシリカ等のケイ素酸化物、さらに必要に応じてアナターゼ型酸化チタン等の光触媒とを含むコーティング剤を用いて、親水性被膜（層）を基体表面に形成させる。

【特許請求の範囲】

【請求項 1】 アモルファス型チタン酸化物とケイ素酸化物とを含む親水性コーティング剤。

【請求項 2】 アモルファス型チタン酸化物とケイ素酸化物と光触媒とを含む親水性コーティング剤。

【請求項 3】 アモルファス型チタン酸化物が、アモルファス型過酸化チタンゾルである請求項 1 又は請求項 2 記載の親水性コーティング剤。

【請求項 4】 ケイ素酸化物が、コロイダルシリカである請求項 1 ～ 3 のいずれか記載の親水性コーティング剤。

【請求項 5】 請求項 1 ～ 4 記載の親水性コーティング剤を基体表面にコーティングさせてなることを特徴とする表面親水性基体。

【発明の詳細な説明】

【 0 0 0 1 】

【発明の属する技術分野】この発明は、レンズ、鏡、金属、タイル、ガラス、繊維・不織布等の基体表面にコーティングすると、その表面が親水性作用を有する、親水性コーティング剤及び該親水性コーティング剤でコーティングした表面親水性基体に関する。

【 0 0 0 2 】

【従来の技術】従来、眼鏡レンズ、浴室鏡、注射針等の表面に親水性・防曇性等を付与するコーティング剤としてはシリコン系樹脂がよく知られている。また、光触媒能を有するアナターゼ型酸化チタン TiO_2 とシリコン系樹脂との混合物からなるコーティング剤をコーティングし、紫外線照射時に親水性作用を発揮する表面親水性基体も知られている。

【 0 0 0 3 】

【発明が解決しようとする課題】シリコン系樹脂を親水性コーティング剤として用いた場合、シリコン系樹脂面に生じる静電気により、大気中の塵埃等が着塵し、その表面を黒く汚すという問題点があった。また、現在、光触媒を担持させる基体として多用されている有機高分子樹脂基板（プラスチック板やプラスチックレンズ）に対して、上記光触媒能を有するアナターゼ型酸化チタン TiO_2 とシリコン系樹脂とからなる親水性コーティング剤を適用すると、酸化チタンによる静電気放電防止作用により大気中の塵埃等の着塵は防止しうるが、光触媒機能により有機高分子樹脂からなるプラスチック材の劣化が著しいという問題点があった。また、この光触媒能を有するアナターゼ型酸化チタン TiO_2 とシリコン系樹脂とからなる親水性コーティング剤は、親水機能を発揮するためには紫外線照射が必要とされており、紫外線が照射されない場所に設置された場合には親水性機能が発揮できないという不都合があった。

【 0 0 0 4 】

【課題を解決するための手段】上記問題を解決するため、鋭意研究したところ、アモルファス型チタン酸化物

とケイ素酸化物との混合物からなるコーティング剤が、極めて優れた親水性を有するのみならず、かつ成膜性に優れ、加えて静電気放電防止作用を有し汚れを静電付着させることがなく、かつ有機高分子樹脂材を劣化させることがないばかりか、紫外線照射がないところでも親水機能を充分発揮しうることを見出し、本発明を完成させるに至った。

【 0 0 0 5 】また、アモルファス型チタン酸化物とケイ素酸化物との混合物に、さらに光触媒を混和してなるコーティング剤をガラス、タイル等の基体にコーティングすると、紫外線照射がない場合であっても、表面親水性機能が発揮されることを見出し、本発明を完成させるに至った。

【 0 0 0 6 】すなわち、本発明は、アモルファス型過酸化チタンゾル等のアモルファス型チタン酸化物と、コロイダルシリカ等のケイ素酸化物とを含む親水性被膜

（層）を基体表面に形成させることを特徴とする表面親水性基体に関する。また、本発明は、アモルファス型過酸化チタンゾル等のアモルファス型チタン酸化物と、コロイダルシリカ等のケイ素酸化物と、アナターゼ型酸化チタン等の光触媒とを含む親水性被膜（層）を基体表面に形成させることを特徴とする表面親水性基体に関する。

さらに、本発明は、アモルファス型過酸化チタンゾル等のアモルファス型チタン酸化物と、コロイダルシリカ等のケイ素酸化物とを含む親水性コーティング剤、及び、アモルファス型過酸化チタンゾル等のアモルファス型チタン酸化物と、コロイダルシリカ等のケイ素酸化物と、アナターゼ型酸化チタン等の光触媒とを含む親水性コーティング剤に関する。

【 0 0 0 7 】

【発明の実施の形態】本発明において、アモルファス型チタン酸化物としては、アモルファス型の過酸化チタン TiO_2 やアモルファス型酸化チタン TiO_2 を例示することができる。アモルファス型の過酸化チタンやアモルファス型酸化チタンには、アナターゼ型酸化チタン TiO_2 、ルチル型酸化チタン TiO_2 と異なり、光触媒機能は実質上殆どない。

【 0 0 0 8 】本発明において用いられるアモルファス型過酸化チタンとして、特に好ましいアモルファス型過酸化チタンゾルは、例えば次のようにして製造することができる。四塩化チタン $TiCl_4$ のようなチタン塩水溶液に、アンモニア水ないし水酸化ナトリウムのような水酸化アルカリを加える。生じる淡青味白色、無定形の水酸化チタン $Ti(OH)_3$ はオルトチタン酸 H_2TiO_4 と呼ばれ、この水酸化チタンを洗浄・分離後、過酸化水素水で処理すると、本発明のアモルファス形態の過酸化チタン液が得られる。このアモルファス型過酸化チタンゾルは、 $pH 6.0 \sim 7.0$ 、粒子径 $8 \sim 20 nm$ であり、その外観は黄色透明の液体であり、常温で長期間保存しても安定である。また、ゾル濃度は通常 1.40

～ 1 . 6 0 % に調整されているが、必要に応じてその濃度を調整することができ、低濃度で使用する場合は、蒸留水等で希釈して使用する。

【 0 0 0 9 】また、このアモルファス型過酸化チタンゾルは、常温ではアモルファスの状態で未だアナターゼ型酸化チタンには結晶化しておらず、密着性に優れ、成膜性が高く、均一でフラットな薄膜を作成することができ、かつ、乾燥被膜は水に溶けないという性質の他に、光触媒に対して安定であるという特性を有している。なお、アモルファス型の過酸化チタンのゾルを 1 0 0 ℃ 以上で加熱すると、アナターゼ型酸化チタンゾルに変化し始め、アモルファス型過酸化チタンゾルを基体にコーティング後乾燥固定したものは、2 5 0 ℃ 以上の加熱によりアナターゼ型酸化チタンになる。

【 0 0 1 0 】本発明において用いられるアモルファス型酸化チタンとしては微粉末状のものやこの微粉末状のものを硝酸等の溶媒に懸濁分散させたゾル状のものが知られている。この光触媒機能を有さないアモルファス型酸化チタンの内、微粉末状のものをを用いる場合には、熱硬化水溶性樹脂などのバインダーと混合してコーティングすることになる。

【 0 0 1 1 】本発明において用いられるケイ素酸化物としては、コロイダルシリカ等の二酸化珪素の他、シリコン、オルガノポリシロキサン等のシロキサン類化合物、水ガラスを挙げることができるが、コロイダルシリカが望ましい。

【 0 0 1 2 】本発明において使用しうる光触媒としては、 TiO_2 、 ZnO 、 $SrTiO_3$ 、 CdS 、 CdO 、 CaP 、 InP 、 In_2O_3 、 $CaAs$ 、 $BaTiO_3$ 、 K_2NbO_5 、 Fe_2O_3 、 Ta_2O_5 、 WO_3 、 SaO_2 、 Bi_2O_3 、 NiO 、 Cu_2O 、 SiC 、 SiO_2 、 MoS_2 、 MoS_3 、 $InPb$ 、 RuO_2 、 CeO_2 などを挙げることができるが、これらの中でも粉末状又はゾル状のアナターゼ型酸化チタン TiO_2 が好ましい。

【 0 0 1 3 】ゾル状のアナターゼ型酸化チタン、すなわちアナターゼ型酸化チタンゾルは、上記のように、アモルファス型過酸化チタンゾルを 1 0 0 ℃ 以上の温度で加熱することにより製造できるが、アナターゼ型酸化チタンゾルの性状は加熱温度と加熱時間とにより多少変化する、例えば 1 0 0 ℃ で 6 時間処理により生成するアナターゼ型の酸化チタンゾルは、 pH 7 . 5 ～ 9 . 5、粒子径 8 ～ 2 0 nm であり、その外観は黄色懸濁の液体である。このアナターゼ型酸化チタンゾルは、常温で長期間保存しても安定であるが、酸や金属水溶液等と混合すると沈殿が生じることがあり、また、 Na イオンが存在すると光触媒活性や耐酸性が損なわれる場合がある。また、ゾル濃度は通常 2 . 7 0 ～ 2 . 9 0 重量 % に調整されているが、必要に応じてその濃度を調整して使用することもできる。

【 0 0 1 4 】光触媒としては、上記のアナターゼ型酸化

チタンゾルの他、粉末状の二酸化チタンとして、例えば市販の「ST-01」（石原産業株式会社製）や「ST-31」（石原産業株式会社製）をも使用しうる。この場合、バインダーとしては、光触媒作用により劣化を受けないもので、かつ、光触媒機能を低下させないものであればどのようなものでも使用できるが、常温での優れた接着性を有する上記アモルファス型過酸化チタンゾルを用いることが望ましい。

【 0 0 1 5 】光触媒体には、光触媒反応を促進補完するものとして、その製造過程で、光触媒機能補助添加金属（ Pt 、 Ag 、 Rh 、 RuO 、 Nb 、 Cu 、 Sn 、 NiO など）を添加しておくこともできる。また、成形前に、光触媒と共に、自発型紫外線放射剤又は蓄光型紫外線放射剤の粒子あるいはこれらの放射剤を混入した粒子を混合しておくこともできる。

【 0 0 1 6 】本発明の親水性コーティング剤には、アモルファス型酸化チタンとケイ素酸化物とともに、紫外線遮断機能や静電気放電防止機能を有する誘電体セラミックス材料や導電性セラミックス材料を、必要に応じて含有せしめることができる。

【 0 0 1 7 】本発明の親水性組成物が担持される基体としては、セラミックス、ガラスなどの無機材質、有機高分子樹脂、ゴム、木、紙などの有機材質、並びにアルミニウム、鋼などの金属材質のものをを用いることができるが、コーティング剤に光触媒が含まれたものを使用する場合、有機高分子材からなる基体は望ましくない。また、その大きさや形には制限されず板状、針状、ハニカム状、ファイバー状、濾過シート状、ビーズ状、発砲状やそれらが集積したものでもよい。

【 0 0 1 8 】本発明のコーティング剤のコーティング方法としては、スプレーコート、ディッピング、スピンコートなどの工法で薄膜を作る方法が挙げられる。また、コーティング薄膜（層）の厚みとしては、親水性付与という目的が達成しうる厚みやバインダー等の造膜性能により決定されるが、例えばバインダー機能をも兼ね備えているアモルファス型過酸化チタンゾルと、コロイダルシリカとの混合物からなるコーティング剤を用いる場合、通常 0 . 5 μm ～ 5 . 0 μm の厚みにコーティングされる。

【 0 0 1 9 】本発明の親水性コーティング剤は、ショウケースガラス、浴室鏡、眼鏡レンズ、自動車のウィンドウガラスやボディーの曇り防止、注射針の体内注入時の刺激痛軽減、窓ガラス、天窓の結露防止、浴室とユニットバスとの間や外壁と窓枠との間やタイルとタイルとの間等のシリコン系シーリング材や油性コーキング材等建材の汚れ防止などに用いることができる。また、光触媒を含むコーティング剤の場合は、ガラスやタイル等の無機材からなる基体表面に付着した塵、油、垢等の汚染有機物が光触媒作用によって分解されるので、外装建築材等に用いることができる。

【 0 0 2 0 】

【実施例】以下に、実施例を掲げてこの発明をさらに具体的に説明するが、この発明の技術的範囲はこれらの例示に限定されるものではない。

参考例 1 (アモルファス型過酸化チタンゾルの製造)

四塩化チタン $TiCl_4$ の 5 0 % 溶液 (住友シテイクス株式会社) を蒸留水で 7 0 倍に希釈したものと、水酸化アンモニウム NH_4OH の 2 5 % 溶液 (高杉製薬株式会社) を蒸留水で 1 0 倍に希釈したものとを、容量比 7 : 1 に混合し、中和反応を行う。中和反応後 pH を 6 . 5 ~ 6 . 8 に調整し、しばらく放置後上澄液を捨てる。残った $Ti(OH)_4$ のゲル量の約 4 倍の蒸留水を加え十分に攪拌し放置する。塩化銀でチェックし上澄液中の塩素イオンが検出されなくなるまで水洗を繰り返し、最後に上澄液を捨ててゲルのみを残す。場合によっては遠心分離により脱水処理を行うことができる。この淡青味白色の $Ti(OH)_4$ 3 6 0 0 m l に、3 5 % 過酸化水素水 2 1 0 m l を 3 0 分毎 2 回に分けて添加し、約 5 °C で一晩攪拌すると黄色透明のアモルファス型過酸化チタンゾル約 2 5 0 0 m l が得られる。なお、上記の工程において、発熱を抑えないとメタチタン酸等の水に不溶な物質が析出する可能性があるため、すべての工程は発熱を抑えて行うのが望ましい。

【 0 0 2 1 】 参考例 2 (アモルファス型過酸化チタンゾルからの酸化チタンゾルの製造)

上記アモルファス型過酸化チタンゾルを 1 0 0 °C で加熱すると、3 時間程度経過後にアナターゼ型酸化チタンが生じ、6 時間程度加熱するとアナターゼ型酸化チタンゾルが得られる。また、1 0 0 °C で 8 時間加熱すると、淡

黄色やや懸濁蛍光を帯び、濃縮すると、黄色不透明のものが得られ、1 0 0 °C で 1 6 時間加熱すると極淡黄色のものが得られるが、これらは上記 1 0 0 °C、6 時間加熱のものに比べて乾燥密着度が多少低下する。この酸化チタンゾルは、アモルファス型過酸化チタンに比べ粘性が低下しているのでディッピングしやすいように 2 . 5 重量%まで濃縮して使用する。

【 0 0 2 2 】 実施例 1

1 5 0 × 1 5 0 m m のフロートガラスに、参考例により作製したアモルファス型過酸化チタンゾル (TiO_2 として 1 . 7 重量%含有) を 2 倍希釈したものに、コロイダルシリカ (日産化学社製、商品名スノーテックス、 SiO_2 を 2 0 . 7 % 含有) を TiO_2 に対する SiO_2 の重量比が、それぞれ 0 %、0 . 5 %、1 %、2 %、8 % になるように混合したものを用いて、上記基体にコーティングした。コーティングには、明治機械社製の直径 0 . 5 4 m m の丸型吹き出しノズルを有するスプレーガン F S - G 0 5 R - 1 を 2 K g / c m² のエア圧で使い、吹き付け量は 0 . 2 g / 1 0 0 c m² とし、吹き付け後、8 0 °C で乾燥させた。また、対照として、表面コーティングをしなかったものを用いた。

【 0 0 2 3 】 次に、各ガラス基板に、水道水 0 . 1 m l をスポイトにて 1 c m の高さから滴下し、紫外線を照射せずに約 1 0 分間放置後、基板上的水滴の直径 (ϕ : 単位 m m) を測定する実験を 4 回繰り返した。結果を表 1 に示す。表 1 からわかるように、本発明にかかる表面親水性基体は優れた親水性を示した。

【 0 0 2 4 】

【表 1】

アモルファス型過酸化チタンゾル	S i O ₂ 混合率 (重量%)					
	0	0 . 5	1	2	8	対照
1 回	1 0 ϕ	1 3 ϕ	1 5 ϕ	1 6 ϕ	1 8 ϕ	1 1 ϕ
2 回	9 ϕ	1 1 ϕ	1 3 ϕ	1 4 ϕ	1 7 ϕ	1 0 ϕ
3 回	9 ϕ	10 . 5 ϕ	12 . 5 ϕ	1 4 ϕ	1 7 ϕ	1 0 ϕ
4 回	1 0 ϕ	1 1 ϕ	12 . 5 ϕ	14 . 5 ϕ	1 8 ϕ	1 0 ϕ

【 0 0 2 5 】 実施例 2

アモルファス型過酸化チタンゾル TiO_2 に代えて、アモルファス型酸化チタン粉末 (出光興産社製、商品名 ; 出光チタニア) とバインダーとしての熱硬化水溶性樹脂との混合物からなるコーティング剤を用いる他は、実施例 1 と同様に行ったところ、ほぼ同様な結果が得られた。

【 0 0 2 6 】 実施例 3

コロイダルシリカに代えて、水性アクリルシリコン樹脂 (ロックペイント社製、商品名 ; シリコマックス) を用いる他は、実施例 1 と同様に行ったところ、ほぼ同様な結果が得られた。

【 0 0 2 7 】 実施例 4

実施例 1 のコーティング剤に、光触媒として更に参考例 2 で得られたアナターゼ型酸化チタンゾルを、 TiO_2 に対する TiO_2 の重量比が約 1 : 3 になるように添加したものを用いる他は、実施例 1 と同様に行った。結果を表 2 に示す。表 2 からわかるように、本発明にかかる表面親水性基体は紫外線照射下でないにもかかわらず優れた親水性を示した。また、コーティング層は紫外線照射下で長期間経過後も何ら変化しないことがわかった。

【 0 0 1 8 】

【表 2】

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